



HIGHWAY SAFETY & DESIGN

Annual Report
2013 Legislative Session



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Highway Safety and Design Annual Report

Executive Summary:

The Highway Safety and Design Section is responsible for the traffic, safety and roadway conditions associated with one of our State's most valuable assets: 3,200 two-lane miles of state highway. As part of this responsibility, the section inventories the associated assets, evaluates conditions, analyzes crashes and ultimately delivers projects to address the needs of the network.

During 2012, this section continued to deliver projects that improve the safety and mobility for all users of our highway network. This included the delivery of 205 miles of pavement projects across the network, construction of major projects such as the Bennington Bypass, US 2 in Danville, Barre City Main Street, Hyde Park roundabout, Morrisville Alternate Truck Route, and US 2 Cabot-Danville as well as a significant number of preventive maintenance and safety improvements. In addition, the Section also continued to support the state's response to Tropical Storm Irene. This was accomplished by providing support to the Operations Division recovery efforts and by progressing the engineering and permitting of approximately 150 miles of highway improvements on those corridors heavily impacted as well as a number of substantial slope stability and culvert projects requiring additional improvements.

The Section continues to be a leader in highway safety initiatives throughout the state. During this past year, this Section led the formation of the Vermont Highway Safety Alliance, a non-profit organization, public/private partnership dedicated to improving the safety of all Vermont highways. This Alliance provides a solid foundation for a collaborative effort that has been ongoing since 2006 and has experienced many successes in reducing highway crashes and related fatalities. The Highway Safety and Design Section's greatest impact on highway safety is through effective engineering of improvements and projects on State and local highways. The two primary conduits for many of these improvements are the Highway Safety Improvement Program and the High Risk Rural Road program. Both of these programs, along with all VTrans projects, focus on cost effective implementation of highway safety improvements.

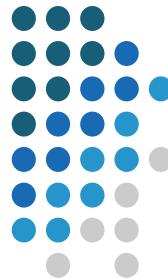
It is important to note several significant improvements in the highway network condition. For the first time in nearly a decade, the number of miles of highway rated in very poor condition is below our 25% performance goal, this year having been reduced to 24%. This combined with a 6% increase in the number of highway segments in good or fair condition is proof that the recent commitment to increased funding and preventive maintenance having a substantial impact on the network.

The fiscal year 2014 Governor's recommended budget for the Paving, Roadway and Traffic and Safety programs will fund the continued principles of preventive maintenance, highway safety and major projects within the Highway Safety and Design Section.

This year's annual report is broken into four sections; Pavement Management, Roadway, Traffic and Safety and Asset Management. For further information regarding the VTrans Highway Safety and Design Section, please contact, Ken Robie, P.E., Program Manager at (802) 828-2645 or email ken.Robie@state.vt.us.

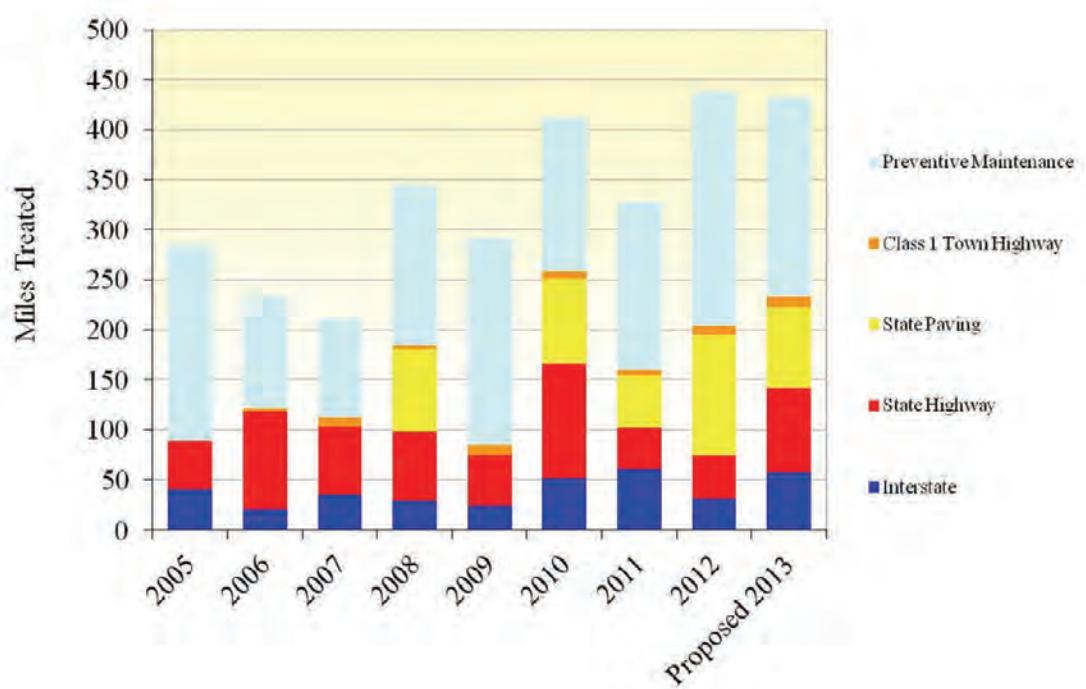
Pavement Management Highlights

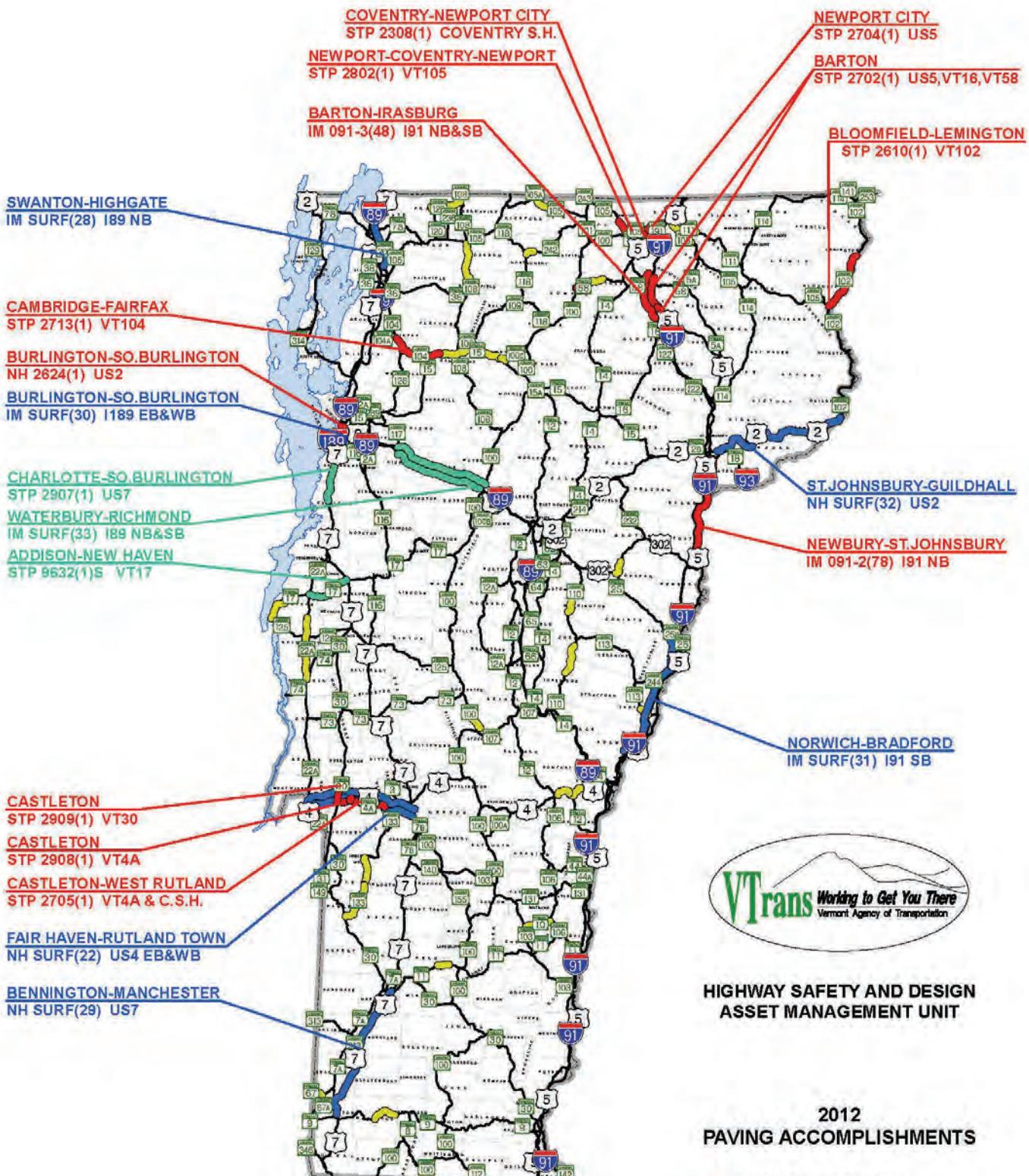
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Category	Construction Season								
	Proposed 2013	2012	2011	2010	2009	2008	2007	2006	2005
Interstate	27	32	55	53	25	30	24	21	41
Carried forward from previous year	31	0	6	0	0	0	12	0	0
Incomplete, to be carried forward	9	31	0	6	0	0	0	12	0
Ruttingfilling (single lane miles)	0	0	0	0	0	0	6	12	22
Surface Treatments	61	37	44	45	52	21	15	9	0
State Highway	78	43	39	87	50	59	68	83	41
Carried forward from previous year	7	0	3	27	0	10	0	15	8
Incomplete, to be carried forward	0	7	0	3	27	0	10	4	15
Surface Treatments	38	85	12	26	7	14	0	0	0
Class 1 Town Highway	11	10	6	8	9	4	9	2	0
Carried forward from previous year	0	0	1	0	2	0	0	1	0
Incomplete, to be carried forward	0	0	0	1	0	2	0	0	1
State Paving	80	120	51	84	0	82	0	0	0
Crack Seal	100	110	111	82	147	124	77	82	153
Carried forward from previous year	0	0	0	0	0	0	0	9	19
Incomplete, to be carried forward	0	0	0	0	0	0	0	0	9
Paving Project Total (items in green)	234	205	161	259	86	185	113	122	90
Preventive Maintenance Total (items in blue)	199	232	167	153	206	159	98	112	194





HIGHWAY SAFETY AND DESIGN ASSET MANAGEMENT UNIT

2012 PAVING ACCOMPLISHMENTS

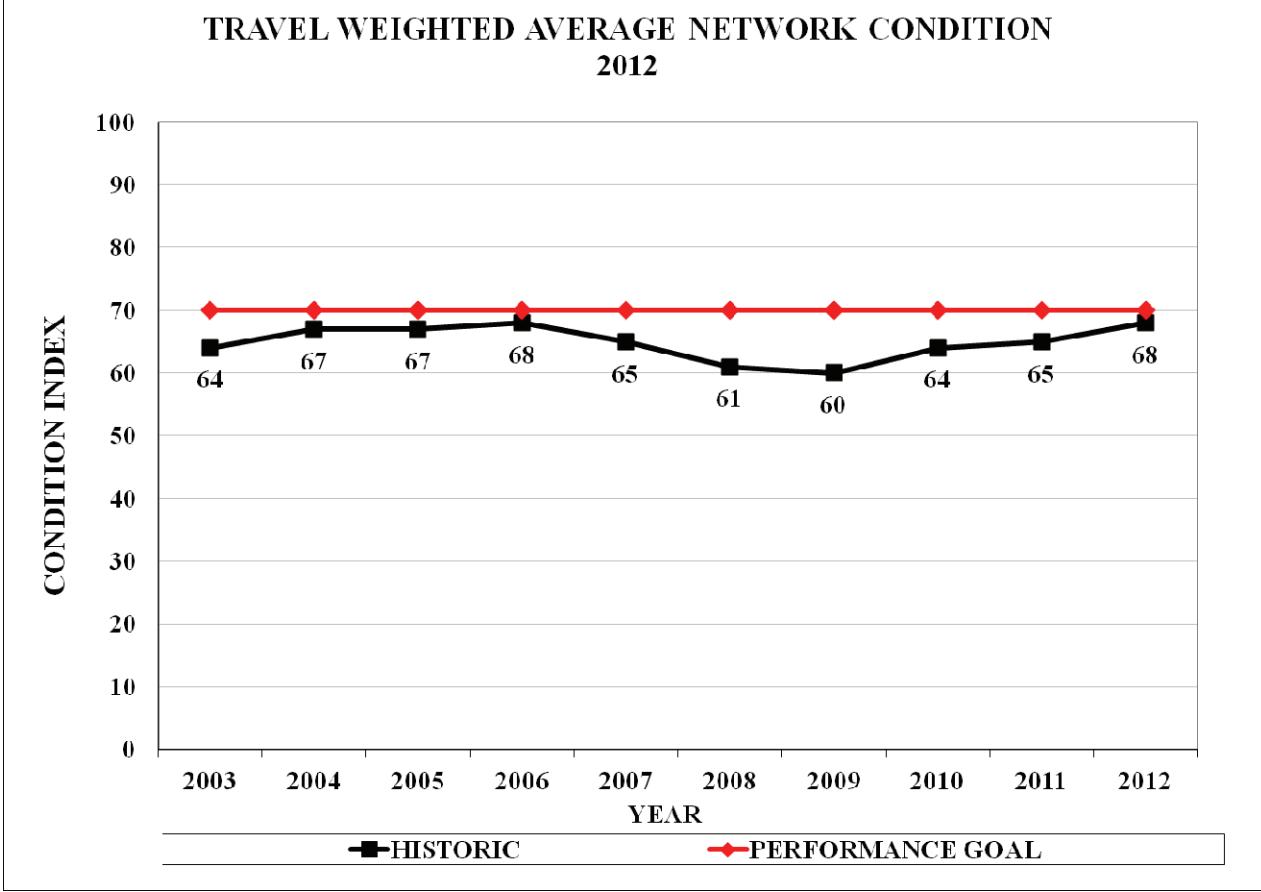
- 2012 PAVING PROJECTS
- 2012 PREVENTIVE MAINTENANCE
- 2012 DISTRICT LEVELING
- 2012 CARRYFORWARD

0 5 10 15 20 Miles

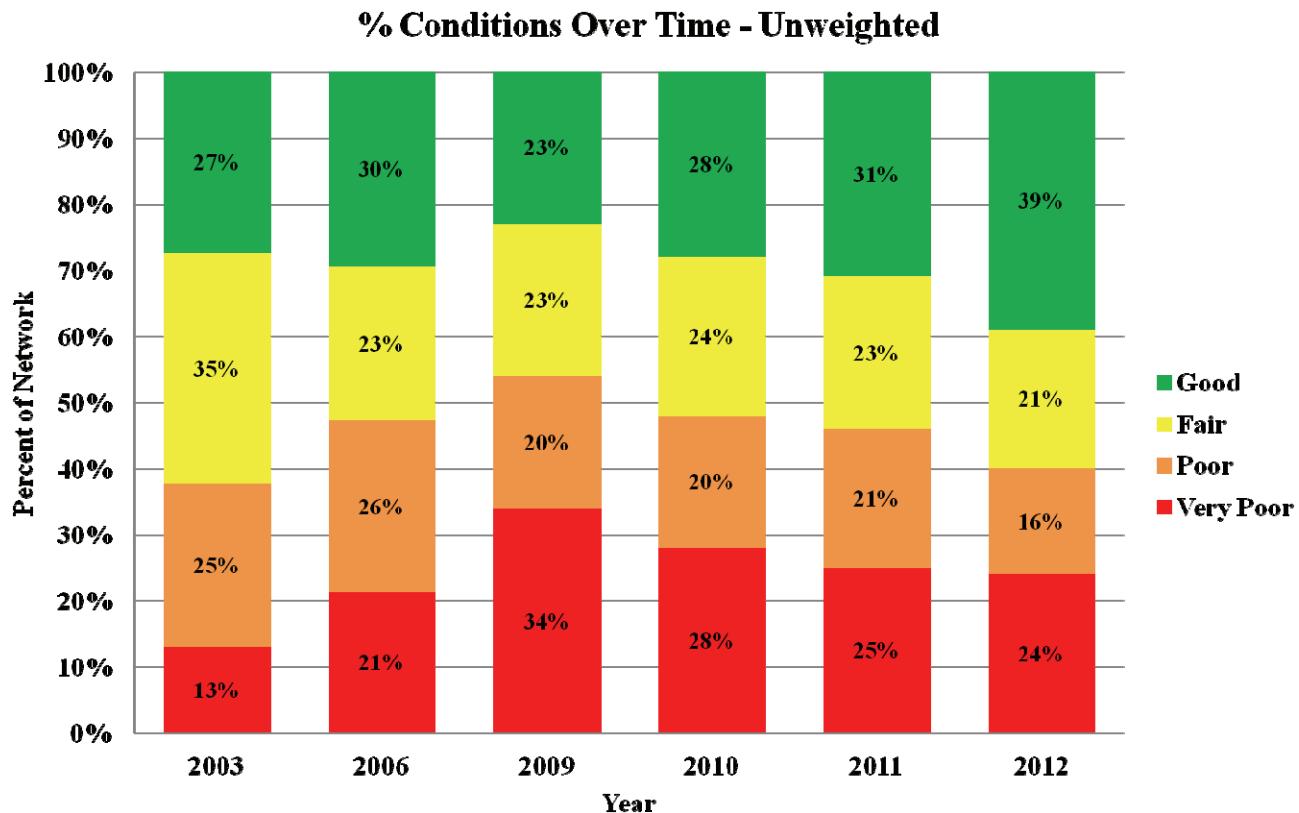
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Performance Measures

Automated surveys are conducted annually to determine pavement conditions across the state. Each segment of road is rated on a scale of 1 to 100 based on rutting, cracking, and roughness. These are then weighted by their respective traffic volumes. The VTrans goal for this performance measure is 70.



Percent of Network in “Very Poor” Condition – While the “Travel Weighted Average Network Condition” graph measures VTran’s performance for the majority of road users, the following graph measures the agency’s performance for all users, including those on low volume roads. The VTran’s goal for the percentage of roads in very poor condition is no more than 25%.



Pavement Condition Descriptions

Good:

- Like new pavement with few defects perceived by drivers
- Composite Pavement Condition Index 80-100

Fair:

- Slight rutting, and/or cracking, and/or roughness become noticeable to drivers
- Composite Pavement Condition Index 65-79

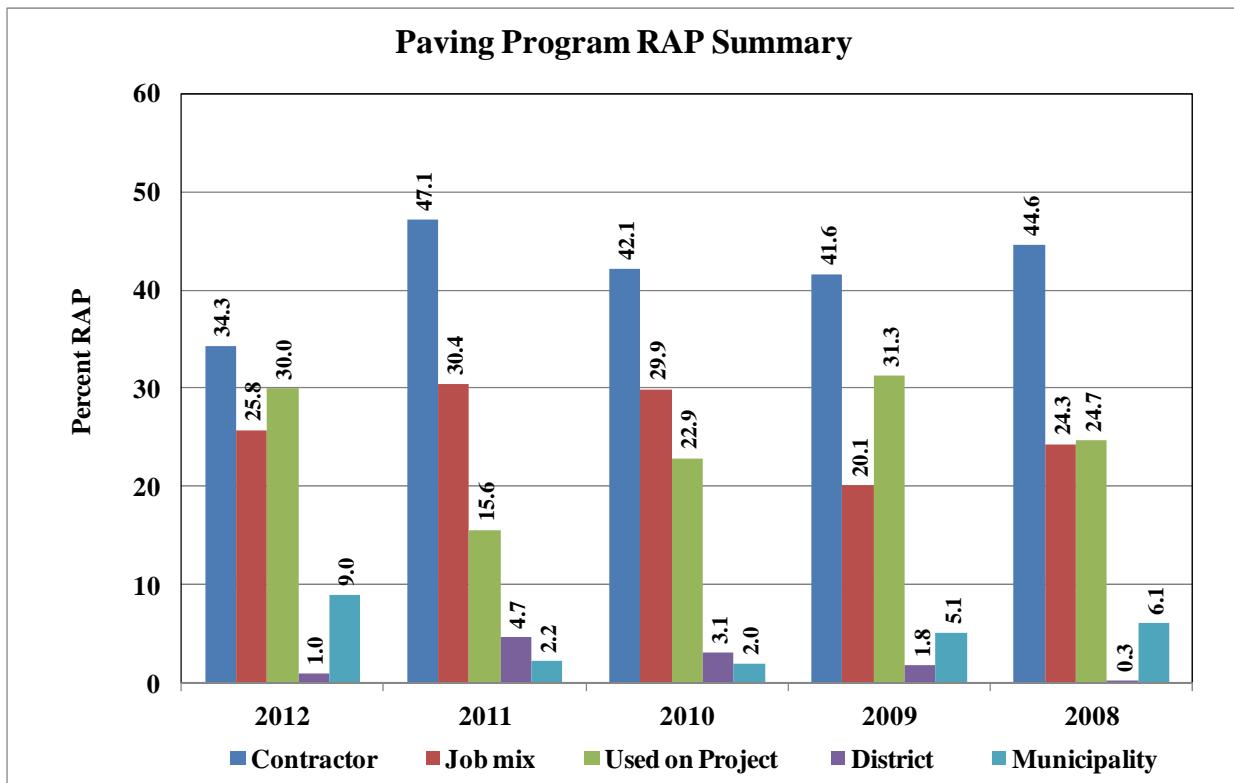
Poor:

- Multiple cracks are apparent, and/or rutting may pull at the wheel, and/or roughness causes drivers to make minor corrections
- Composite Pavement Condition Index 40-64

Very Poor:

- Significant cracks may cause potholes, and/or rutting pulls at the vehicle, and/or roughness is uncomfortable to occupants. Drivers may need to correct to avoid defects.

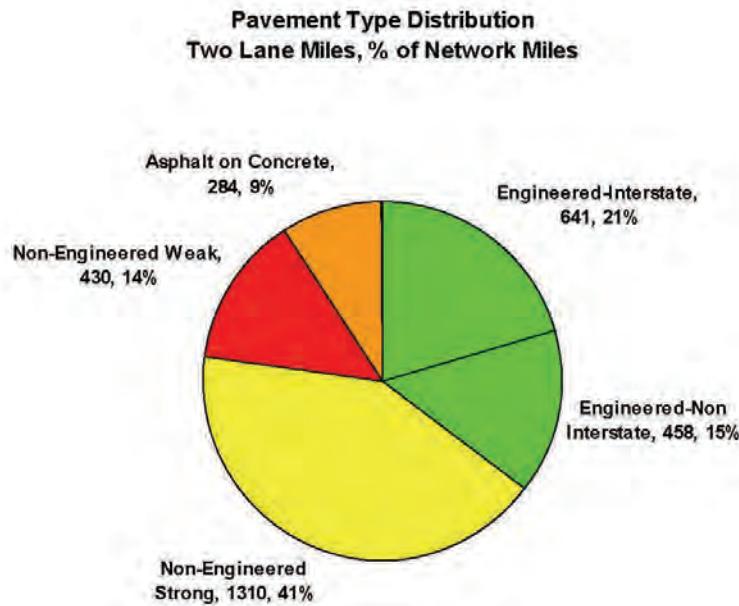
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During the 2008 legislative session, lawmakers challenged the Agency to develop specifications that would facilitate the increased use of recycled-asphalt pavement (RAP) in our hot mix asphalt pavements. In concert with that requirement they asked that we also monitor our production and usage of the material to get a better understanding of its true value. The information compiled since the 2008 season clearly indicates VTrans' commitment over that period to recycling pavement in nearly every project in some capacity. However, we do continue to look for opportunities to place a Vermont specific monetary value on this asset. Anecdotally, national opinion puts an in-place value in the range of \$1/ton to \$40/ton. Taking the liberty to look at it from that perspective indicates the estimated value of the 2012 harvest to be somewhere between \$209,200 and \$8,368,000, with either figure representing a significant value.

As indicated above, 209,200 tons of RAP was generated by VTrans' paving activities during the 2012 construction season. During construction activities in 2012, 116,600 tons of RAP was used on these projects, a total equivalent of 56 percent of the amount of RAP generated. Typical rates of RAP used within hot mix produced for VTrans' projects is between 0% and 25%. Overall, the 53,900 tons of RAP used in 2012 mixtures represented an average usage rate of 14 percent of the 373,500 tons of new mix produced for VTrans projects.

Network Pavement Structural Types



The chart above represents the breakdown of the various pavement structural types a motorist will encounter throughout the Agency's highway network. This information provides a sense of how the network structures vary, and how that can pose a challenge from a management perspective.

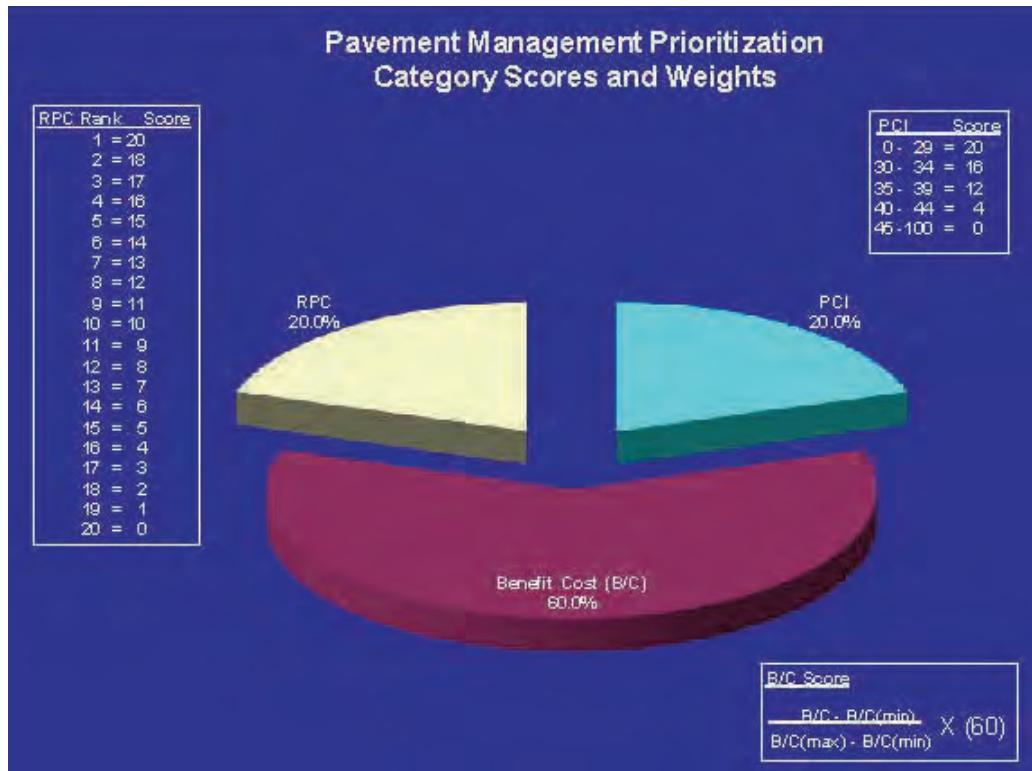
Interstate travel provides a motorist the best example of an *Engineered* pavement/highway. *Engineered* pavement is designed and constructed from the bottom up with the expectation that if maintained properly over time, the pavement will stand up very well to Vermont's harsh climate for 40 years or more. About 36 percent of the State's pavements are *Engineered*, and it is these pavements which can be managed the most effectively, both in terms of cost and serviceability.

About 55 percent of the network is composed of *Non-Engineered* pavements. A *Non-Engineered* pavement is a structure that has been built-up over the years based on minor treatments and maintenance activities. The end result is a highway evolving from what may have once been a logging road into what is now a paved roadway. Some of these pavements perform reasonably well over time. Fortunately, 41 percent of the network's pavements respond in this manner and are considered *Non-Engineered Strong*. It is the remaining percent – the 14 percent of the network that is *Non-Engineered Weak* pavements – that pose the greatest challenge to the Agency. A significant investment is required to keep these pavements in good condition for a reasonable amount of time.

The last pavement structure classification is *Asphalt on Concrete*. These comprise 9 percent of the state highway network pavements, and they are a challenge to manage effectively. Often times they are discernable to the untrained eye where cracks reflect through the asphalt revealing the slabs beneath. While strong, problems exist where a lane has been widened beyond the slab's edge because the additional pavement will distress or settle differently creating a poor ride. Unfortunately, these structures are typically maintenance intensive and do not perform well with a conventional resurfacing treatment.

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Project Prioritization



The chart above illustrates the weighting and scoring of the components built into the Pavement Management Section's project prioritization system. Below each component is defined in terms of their respective characteristics and the effect of the measure on a project's overall rating. The system was developed in 2005 and continues to play an integral role in the development of our annual programs.

Asset Condition (PCI)

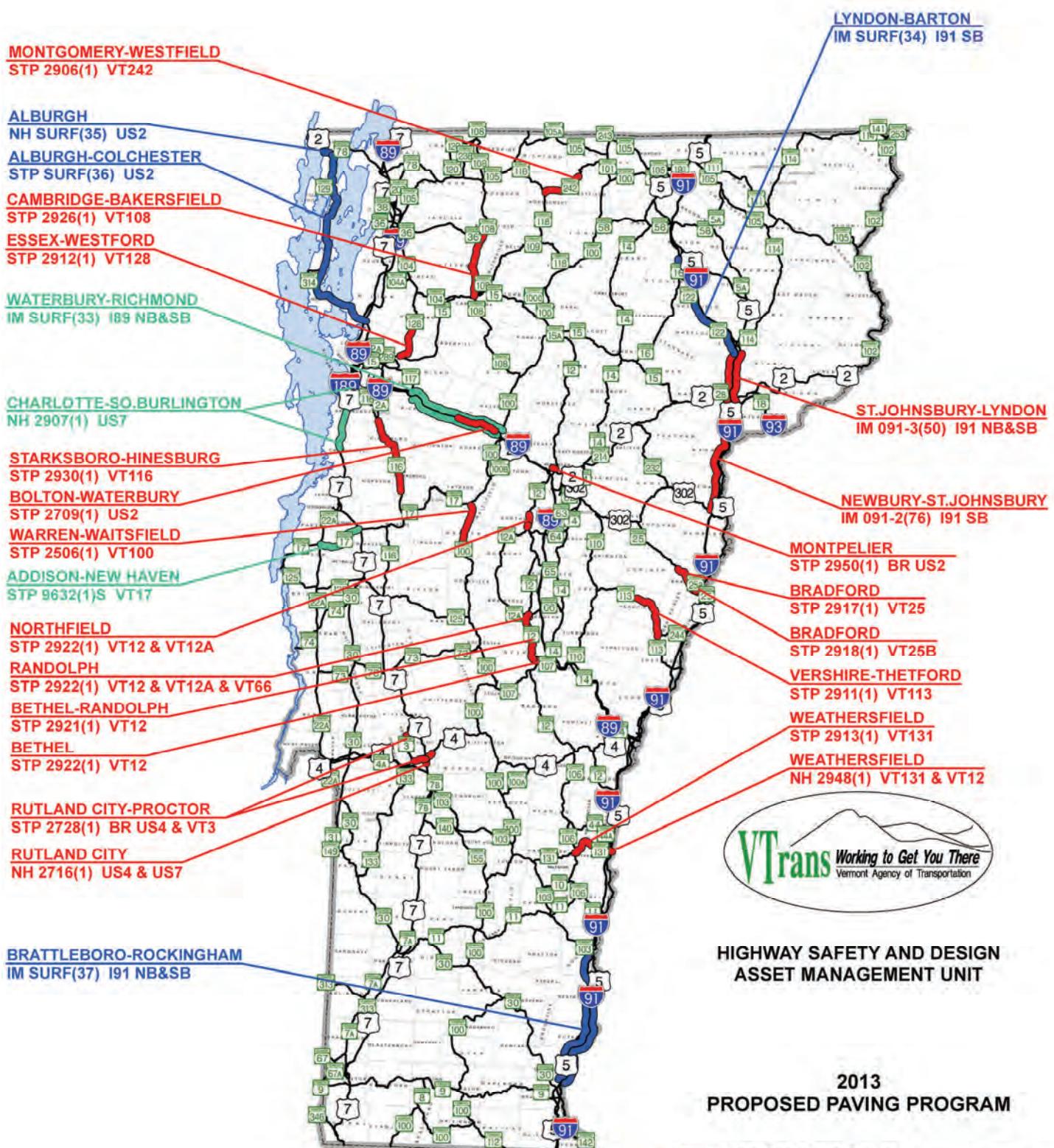
- Pavement Condition Index
 - Combination of; Ride, Rut, Cracking
 - Scoring structured to recognize need to address roads in very poor conditions regardless of traffic

Project Economics (Benefit Cost)

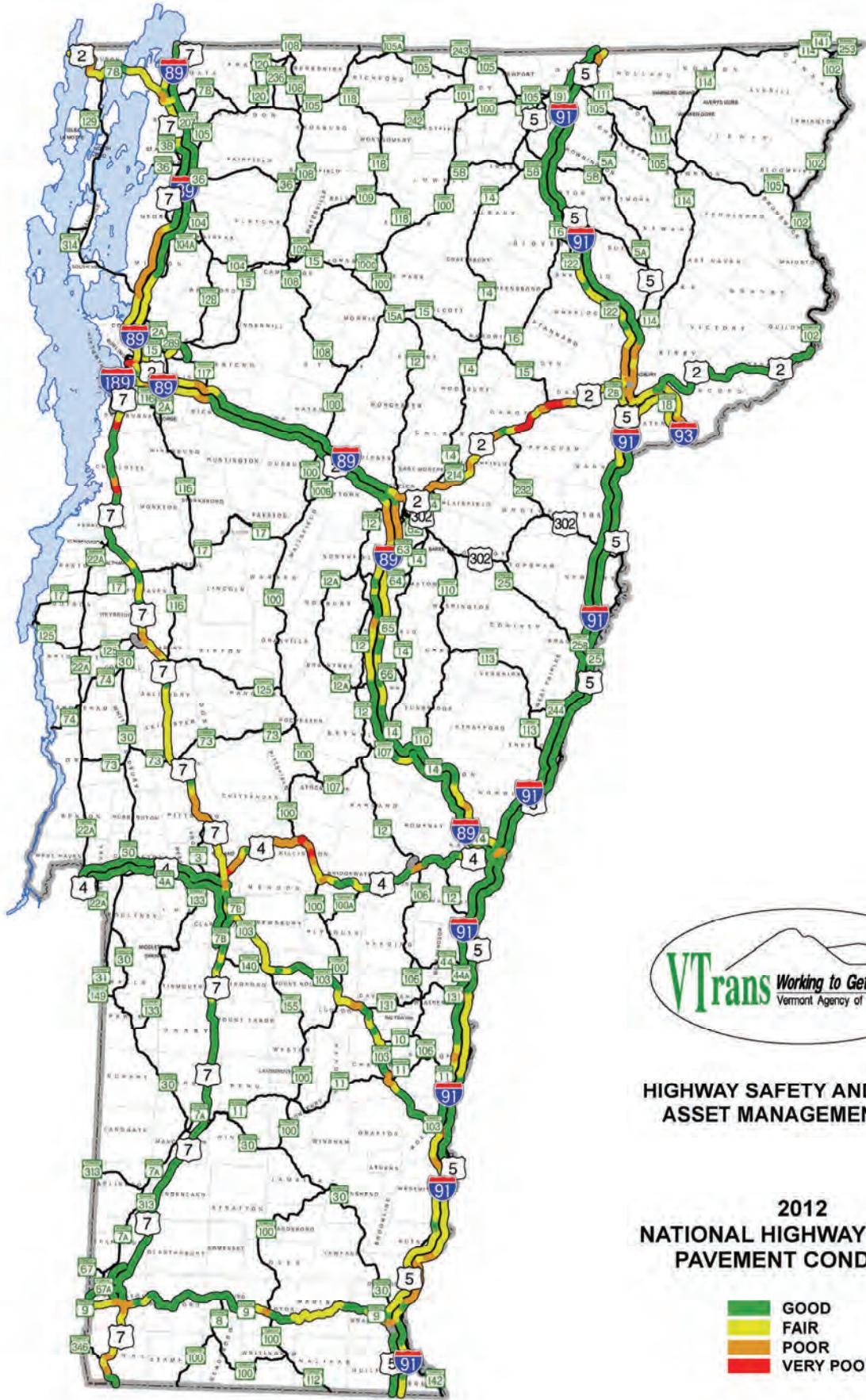
- Benefit Cost Ratio
 - Benefit compares condition difference between the selected treatment and doing nothing on the project section over the lifespan of the treatment
 - Benefits are weighted by traffic volume
 - Cost is present value financial cost to the State
 - Measures the "Bang for the buck" amongst candidate projects

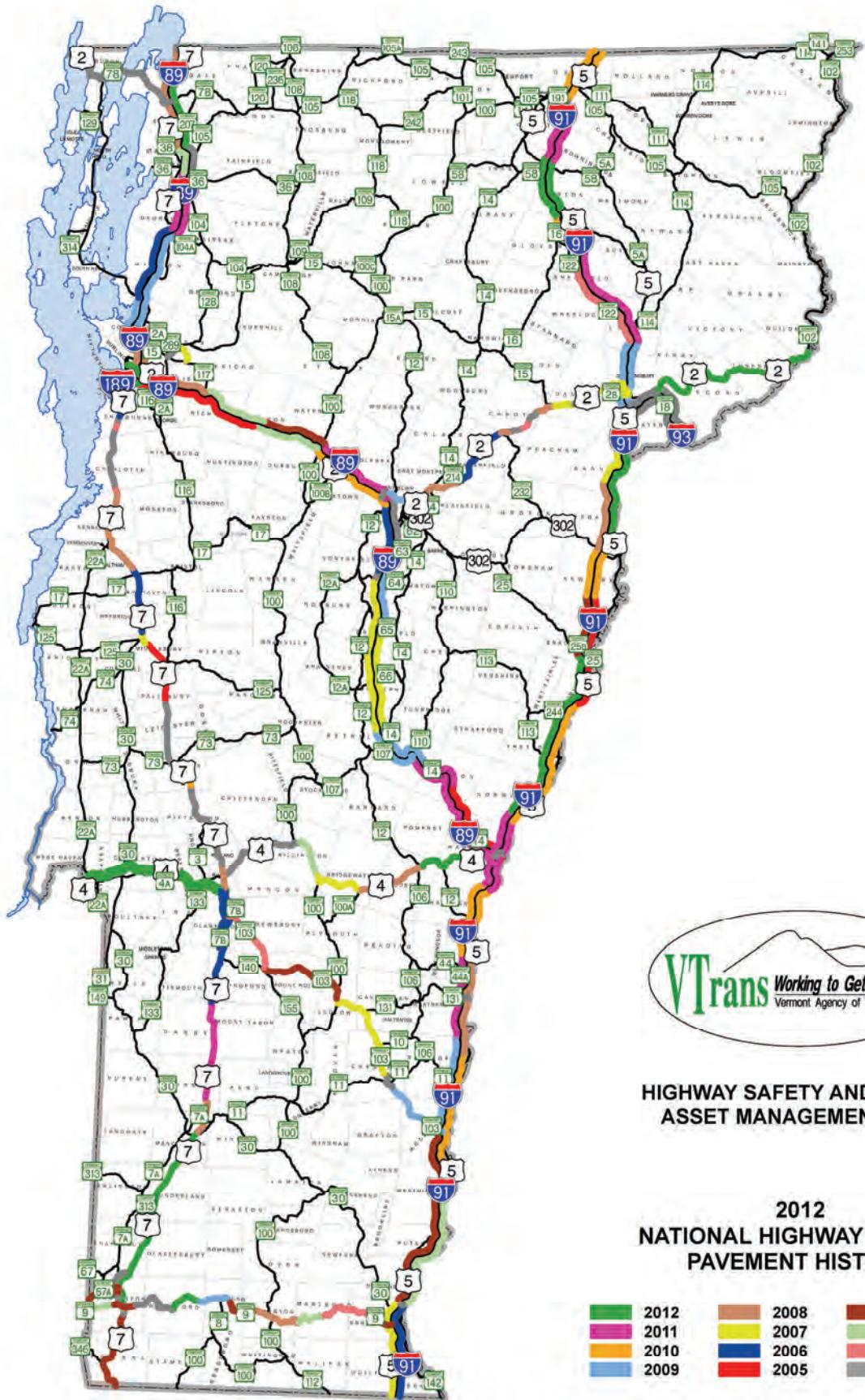
Regional Planning Commission (RPC) Rank

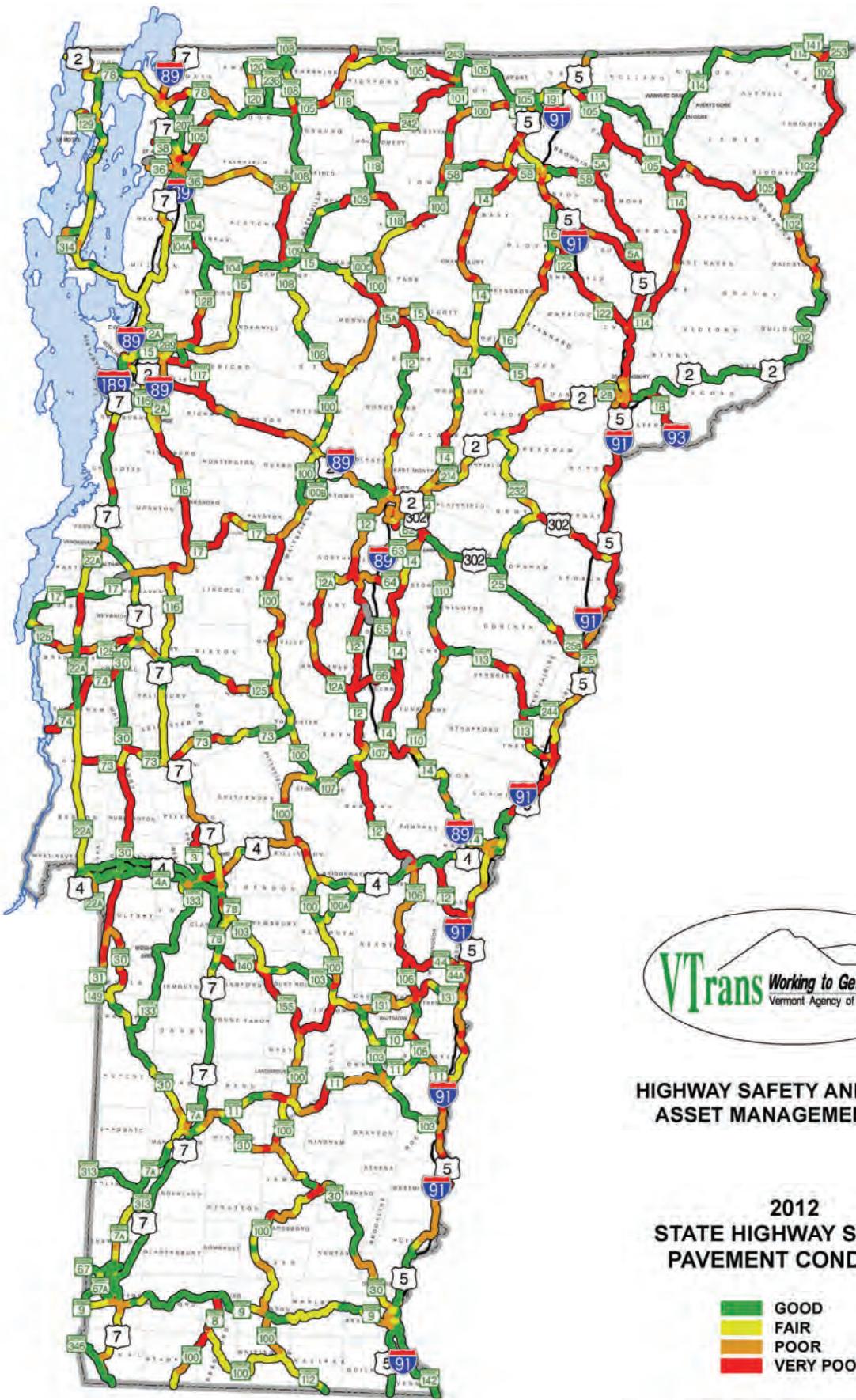
- Regional Importance
 - Allows RPCs to address; socio-economic, cultural/local importance and impact on local economy of candidate projects
 - Scoring structure helps create a geographically distributed program



0 5 10 15 20 Miles







**HIGHWAY SAFETY AND DESIGN
ASSET MANAGEMENT UNIT**

**2012
STATE HIGHWAY SYSTEM
PAVEMENT CONDITION**



HIGHWAY SAFETY AND DESIGN
ASSET MANAGEMENT UNIT

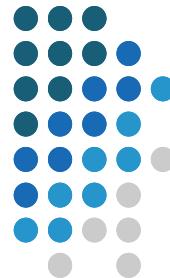
**2012
STATE HIGHWAY SYSTEM
PAVEMENT HISTORY**

2012	2008	2004
2011	2007	2003
2010	2006	2002
2009	2005	PRIOR YEARS

Miles
0 5 10 15 20

Roadway Design Highlights

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Bennington NH F 019-1(5): VT 279 North

Construction of the Northern Segment of VT 279 began in 2007 and was completed in 2012. The 3.1 mile segment of the new road consisted of five separate contracts and the total construction cost will be approximately \$68M (excluding the new Welcome Center). The fifth contract was awarded in Spring 2010 and was completed in Summer 2012. With this contract completed the Segment of VT 279 from VT Route 9, east of Downtown Bennington, to US Route 7, north of Downtown Bennington, was ready to be opened to use by the public providing a transportation route that makes the transportation of goods more efficient, reduces vehicular emissions, and improves safety for all users. An opening ceremony was held on August 30, 2012.

Construction of the Welcome Center within the interchange was started in Spring 2012 and is anticipated to be completed in July 2013.



Bennington Bypass mainline: looking west towards the systems interchange.



Bennington Bypass mainline: looking southeast towards the system interchange.



Bennington Bypass Ribbon Ceremony with Governor Shumlin and Secretary Searles



Bennington Bypass mainline: looking south between the US 7 bridges over 279.

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Barre City FEGC F 026-1(34): Contract 2



Excavation along Main Street

Project History:

- This project, identified as Contract 2, represents the full reconstruction of downtown Main Street beginning at the US 302/VT 62 Interchange and extending southerly for approximately one-half mile to the City Park. All advanced signal installations to support the primary temporary detour along Maple Avenue/Summer Street/Elm Street were performed under Contract 1 constructed in 2010 and completed in 2011 prior to commencement of Contract 2. Project development incorporated close coordination with City representatives through a Project Advisory Committee.



A picture along Main Street as the project nears completion.

Design Solution:

- The approved design includes full depth reconstruction of US 302 (Main Street) including new roadway, sewer and water, storm water drainage and treatment, sidewalks and streetscape amenities.

Construction:

- The multi-year project began in July 2011 and was substantially completed in November 2012. Final paving along a small portion of Main Street and pavement resurfacing of the Maple Avenue/Summer Street/Elm Street temporary detour will be completed in the Spring of 2013.

• Construction Cost:

Contract 1 - \$1,224,000

Contract 2 - \$10,616,000



A picture along Main Street after the project was completed.

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Danville FEGC 028-3(32)

Danville Village - US Route 2 Reconstruction



Looking west from the village center on US 2.



Looking east to the village on US 2.

Project History:

- Upgrades to US Route 2, the primary east-west corridor in northern Vermont, have been underway since the late 1970s. The planning and design of the one-mile section of this roadway through Danville Village has been in the works for 25 years. In 2000, after the consideration of many options and alternatives, VTrans partnered with the Vermont Arts Council and the Danville community to develop a context sensitive design meeting the needs of both the traveling public passing through the village and those that live and do business there.

Design Solution:

- In order to maintain the village character while accommodating over 7000 cars per day, a typical rural highway design would not work. Being a 50 mph highway on either end of the village, measures were needed to provide a safe and attractive environment for residents and business in the village. This is to be accomplished with a narrower, curbed roadway and with median islands, ornamental lighting, street trees, sidewalks and crosswalks, artwork, a traffic signal and removal of overhead utilities in the area of the village green. Changes in the traffic pattern around the village green and upgrades to those town roads are also steps to be taken to achieve that goal.
- Upgrades to US Route 2 include full roadbed reconstruction and paving, subsurface drainage, storm water collection and treatment, and municipal waterline replacement.

Construction:

- Construction began in May 2010 and is expected to be completed in 2013.
- Activities accomplished this year included full reconstruction of US 2 east and west of the Village Green, including all curb, sidewalk, street lighting, trees, ect.), utility relocation within the Village Green, and the partial reconstruction of the town highways around the Village Green.
- Estimated Construction Cost = \$8,000,000

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Fairfax STP SCRP(6)

Project History:

- This project, identified as a deteriorating undersized culvert along VT 104 A in 2010, represents a collaborative effort by District Operations and Program Development in the Highway Safety and Design Section's Culvert Rehabilitation Program.



Outlet Footings, Wing Walls and End Box Sections Being Installed

Design Solution:

- The approved design included replacing two existing corrugated metal pipes with a new precast concrete box structure along the approximately same alignment with aquatic organism passage. It also included new roadway approaches, stream bank stabilization, guardrail and signs.



Completed Structure Installation, Roadway Reconstruction and Embankment Stabilization.

Construction:

- The project was designed by VTrans staff and constructed by VTrans District Operations under an accelerated construction that included temporary full closure of VT 104. Construction began at midnight Friday September 14 and was re-opened to traffic at 2:00 AM on Sunday September 16.
- Project Costs: \$200,000

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Morristown STP F 029-1(2) C/1

Project History:



View of southern bridge approach across Lamoille River

This project is for the construction of a 545 foot span bridge over the Lamoille River that is part of an overall project that provides a new 1.98 mile roadway that will connect Route 100 to Route 15, and provide an alternative route for large trucks and through traffic around the historic village of Morrisville. This project has been under development since the early 1970s and enjoyed nearly universal support in the local and regional community. Morristown and the Lamoille County Planning Commission worked closely with the Agency for many years to address the various planning, engineering, and permitting needs for the project. The Agency pursued phasing the overall project to construct the bridge first based on the minor amount of ROW needed for the bridge. This would allow the more complicated bridge work to start ahead of the roadway work and realize a potential savings while allowing the entire project to open to traffic at the same time.



View of MSE wall and roadway excavation work (behind Pack & Park Self-Storage)

Design Solution:

The original design concept for the bridge over the Lamoille River proposed a pier in the river and on each shoreline. The current design is a slant-legged rigid frame (also called a “grasshopper” bridge), which spans most of the river channel and does not need a pier in the river. This avoids the direct impact of a pier and the related scour and streambed impacts which can occur. Visually the bridge will allow motorists to view the scenic river crossing.

Construction:

The contractor was allowed to utilize borrow from the roadway portion of the project for fill needed for the bridge. This work needs to be accomplished before July 1, 2013 to allow the area to be free for the future roadway contractor.

Construction began in July 2012 and is expected to be completed in 2014.

Activities accomplished this year included excavation of the bridge approaches, excavation of fill from borrow area, installation of the cofferdams, detention basin, installation of Mechanically Stabilized Earth wall, driving piles and construction of abutment footings.

Bridge Construction Cost:\$7,961,000

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CABOT - DANVILLE FEGC F 028 – 3(26) C/1



New roadway construction with truck climbing lane.

Project History:

This project, identified as Contract 1 of the Cabot - Danville corridor, represents the first of three segments along US Route 2 to be reconstructed, increasing the existing narrow roadway and shoulders to a full width typical section and significantly improving the horizontal and vertical alignments. It also included the construction of a wetland mitigation site in the Town of East Montpelier to compensate for wetland impacts along the roadway.

VTrans instituted many design changes over the years throughout the project's development to reduce the footprint through this sensitive area and conducted an exhaustive search to provide the most environmentally sound area for wetland mitigation.

Design Solution:

The new roadway typical section includes 12 foot travel lanes and 8 foot shoulders to satisfy the requirements of the type, speed and traffic demands of the roadway. It also includes an 11 foot eastbound truck lane for 3900 feet, needed due to the steep grades along this stretch of US Route 2.

In addition to the full depth reconstruction of the roadbed, extensive drainage and guardrail improvements are included in the new design.

Of special interest were: a realignment of approximately 350 feet of Molly's Brook; the replacement of an obsolete concrete culvert with a new, precast concrete box culvert with mechanically stabilized earth retaining walls near the Marshfield Reservoir; and the replacement of a section of Green Mountain Power's ancient and leaking, wooden penstock under US Route 2 with a new steel section to match that of the rest of the penstock being replaced along the roadway concurrently by Green Mountain Power.

Comprehensive traffic control enhanced safety throughout the duration of the project.

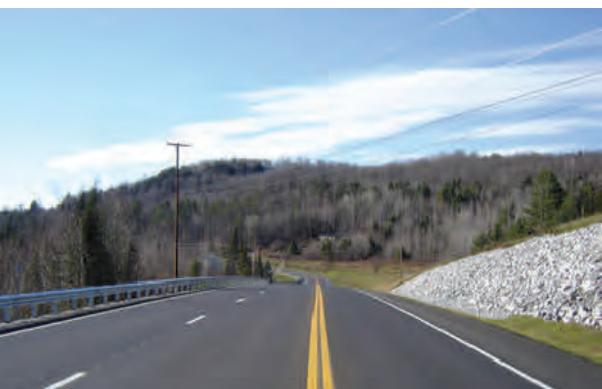
Construction:

Project Cost: Approximately 8,800,000.

Construction began in May 2011 and was completed in October 2012.



Molly's Falls Brook concrete box and retaining wall.



New roadway construction with truck climbing lane.

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Berlin – Montpelier IM 089-1(53)

Project History:



Before construction.

- The Berlin – Montpelier ledge project was located on I-89 NB in Berlin – Montpelier just south of the Montpelier Exit 8 Interchange. The project was brought to Highway Safety & Design's attention through the Rockfall Hazard Rating System (RHS) and the VTrans Geologist in 2007. Through the RHS the ledge cut was given a 540 rating, placing this cut in the higher tier of ledge cuts needing remediation.
- The two main factors attributing to the 540 rating were the height of the ledge cut and loose rock. Loose rock falling from the top of the ledge cut had the potential to reach the travelled way of I-89 NB posing a significant safety risk to the travelling public.



During construction.

Design Solution:

- With coordination from the Materials & Research section's Soils and Foundations Unit a remediation was developed for the rock cut. Hand Scaling through industrial rope access methods were used to removed the loose rock from the ledge cut.
- Although the loose rock on the face of the ledge was to be removed it was anticipated that, due to weathering, rock would continue to loosen and fall. With this being expected a Rockfall Catchment Fence was designed to retain these future rock fall events and keep them from reaching the roadway



After construction

Construction:

- Construction began in April of 2012 with completion in July of 2012.

Approximate Construction Cost: \$485,000.00

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Stockbridge ER 022-1(26):



Pre-construction.

Project History:

- The Stockbridge rock fall project was located on VT 107 in Stockbridge on “Refrigerator Flats”; the project was brought to Highway Safety & Design’s attention through crews finalizing Irene related work in the VT 107 corridor.
- While ditch cleaning work was being performed, a large section of ledge slid off the slope and filled the ditch line directly adjacent to the travel lane. Operations in the area were halted until the ledge cut could be evaluated.
- Upon evaluation of the ledge cut the VTrans Geologist determined that the entire ledge cut was extremely unstable and needed to be remediated. This in turn led to the project being declared an emergency due to the threat to the traveling public, which allowed the remediation to be expedited.



During construction.

Design Solution:

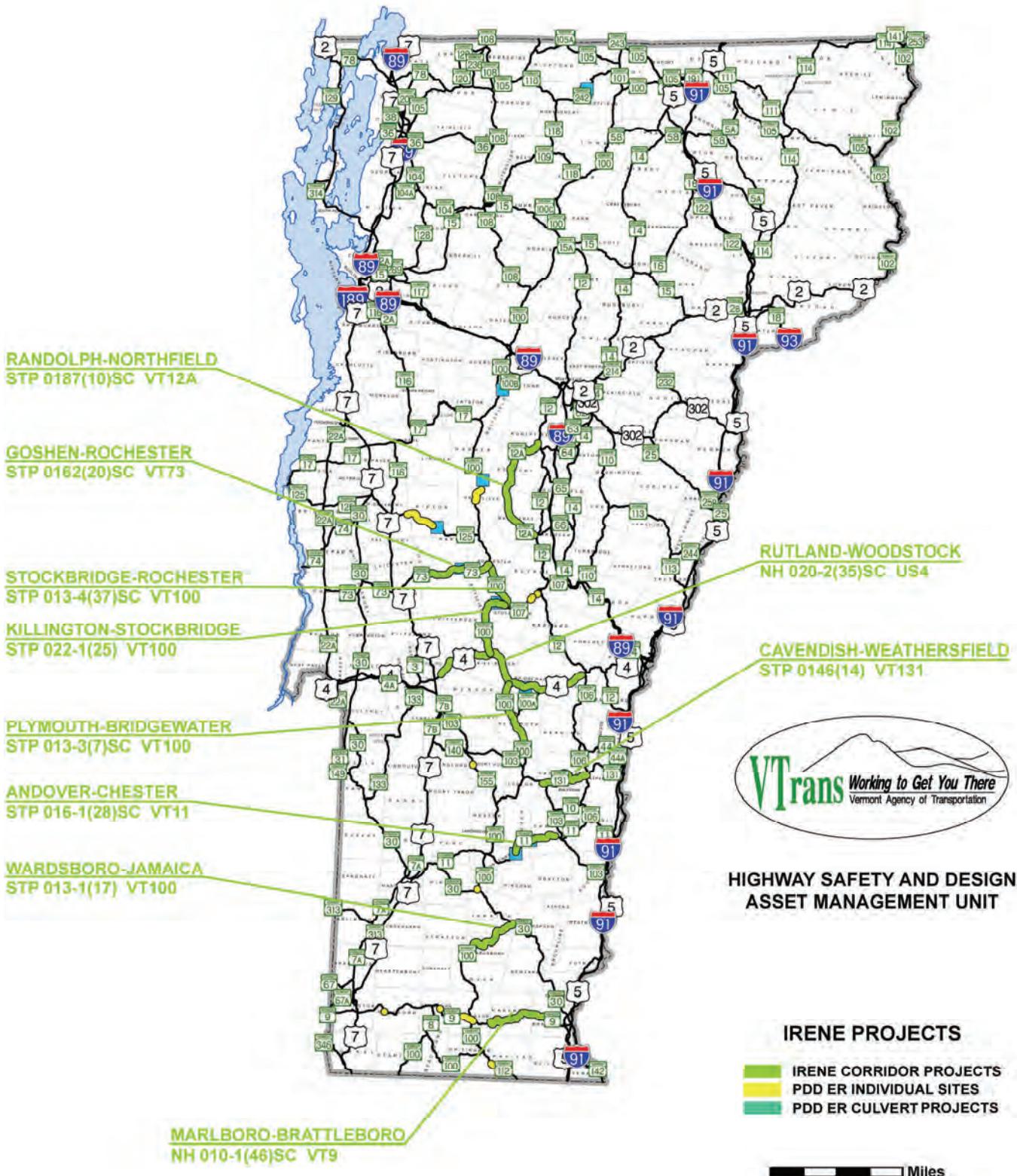
- With coordination from the Materials and Research Section’s Soils and Foundations Unit, plans for remediation of the ledge cut were developed.
- It was determined that the ledge cut would need to be machine scaled and trees would need to be removed from the crest of the ledge.
- Due to the nature of the ledge, the future stability of the face could not be guaranteed, so wire mesh netting was proposed as a further safe guard.

Construction:

- Construction began in September of 2012 and was completed in November.
- After machine scaling was complete it was determined that rock doweling would be needed to stabilize larger areas of rock as well as the wire mesh netting to stabilize some of the smaller areas of rock. The dowels and netting served as ways to stabilize these additional areas without “chasing” the unstable ledge up a steep slope, thereby avoiding large amounts of ledge removal and large impacts to adjacent property owners.
- Approximate Construction Cost: \$1,200,000

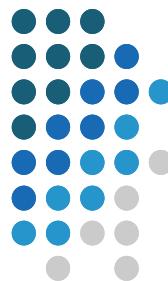


During construction.



Traffic & Safety Highlights

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VERMONT'S HIGHWAY SAFETY ALLIANCE

In 2012, VTrans worked with a multitude of public and private organizations to form Vermont's first Highway Safety Alliance (VHSA), an independent, non-profit organization. The objective of the VHSA is to significantly reduce the number of crashes on Vermont's highway through a collaborative and unified effort. One of the most basic functions of the organization is to act as a resource for crash data, information, initiatives and resources to highway safety stakeholders throughout the state. Through coordination and collaboration, the VHSA will be more effective and efficient when providing strategies and solutions within private industry and government entities dedicated to improving the safety of our highways.

The organizational structure of the VHSA demonstrates the commitment to widespread involvement. The organization is guided by a Board of Directors that currently includes private sector partners: VT League of Cities and Towns, Truck and Bus Association, AAA, Coop Insurance, Youth Safety Council and AARP; six core state government agencies; Transportation, Health, Motor Vehicles, Governor's Highway Safety, Education and Public Safety; three federal partners: Federal Highway Administration, Federal Motor Carrier Administration and the National Highway Traffic Safety Association. In addition, the action arms of the Alliance include five Focus Groups: Outreach & Marketing, Infrastructure, Enforcement, Education and Data & Performance Measures. Currently, nearly fifty safety partners from all corners of the state participate in the Focus Groups.

Many of Vermont's partners in highway safety have been meeting for a number of years in an effort to provide a more collaborative approach to highway safety. In 2006 this collaboration resulted in Vermont's first Strategic Highway Safety Plan (SHSP). This plan was created through the involvement of well over one hundred of our state's highway safety stakeholders representing the "Four E's" of highway safety: Enforcement, Education, Engineering and Emergency Medical Services. The VHSA is currently undertaking a major initiative to revisit and rewrite the SHSP. This includes a review of existing data, trends, recent successes and areas for improvement. Based on this information the Board of Directors has

currently identified six critical emphasis: Infrastructure to include Lane Departure and Intersections; Age Appropriate Solutions which is focused on young and older driver populations; Speeding and Aggressive Driving, Occupant Protection to include safety belts, child passenger restraints and helmets, Impaired Driving and Distracted Driving. In addition, several other emphasis areas have been identified that are significant, however not currently viewed as critical areas. These include motorcycle safety, vulnerable users, medium and heavy vehicles, emergency medical services, work zone safety and crash data.

While significant progress has been achieved, Vermont still experiences an average of 70 lives lost, hundreds of incapacitating injuries and over 12,000 crashes on our highways each year. We must do better. The VHSA recognizes that the time is now.

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HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP)



HSIP Example Project Site – New Haven US 7/North Street intersection, before safety improvements.
Note the lack of pavement markings.



HSIP Example Project Site – New Haven US 7/North Street intersection, after safety improvements. Note the new pavement markings on both US 7 and River Road.

Program History:

- This year, the VTrans Safety Section identified the top 25 locations in need of safety improvements on the Vermont federal aid highway system. These locations are selected based on crash frequency, severity, and traffic volume.
- The Safety Section held a meeting at each location. Often times these meetings included key town officials, the Regional Planning Commission (RPC), emergency responders, and highway engineers.
- It is at these meetings where information is gathered which aid in VTrans' safety improvement recommendations.

Design Solutions:

- After the 25 locations were reviewed, a report was drafted specifying the crash history, anecdotal safety information gathered from the on-site meeting, and short and long term recommended solutions.
- Often times the short term solutions are low cost safety improvements such as new signs and lines, guardrail, brush clearing, minor intersection alignment improvements, and signal head upgrades.
- Each year, there are usually 2 - 6 of these locations programmed as safety projects, and the long term solutions are implemented. These projects are much more involved and can consist of roadway realignment, the installation of a roundabout, or new turning lanes.

Construction:

- Each year, \$50,000 to \$100,000 is spent to implement the short term improvements identified in the HSIP. \$2 million to \$4 million is spent on more substantial, long term safety improvements on a yearly basis.

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High Risk Rural Roads Program (HRRR)



HRRR example project site, before safety improvement-Hinesburg, Charlotte Rd



HRRR example project site, after safety improvements–Hinesburg, Charlotte Rd

Program History:

- The High Risk Rural Roads (HRRR) program was initiated in 2008. The purpose of the program is to partner with the Regional Planning Commissions (RPCs), FHWA, and the Towns to implement low cost safety improvements on all of Vermont's public highways
- Based on crash data and local input, sites are identified, selected and prioritized by the RPC's, Towns and VTrans.
- Each summer, VTrans works closely with the Towns in determining the appropriate safety solutions at each site.

Design Solution:

- There were 24 sites selected this year.
- VTrans contracted these projects, and oversaw the construction operations for the participating municipalities, in order to simplify the process for them.
- Four regional umbrella projects were contracted, implementing low cost safety improvements such as new and upgraded signs and lines, and new guardrail.

Construction:

- the cost to install high Risk Rural Roads improvements, under 4 regional construction projects, was approximately \$500,000.
- Work started in spring 2012, and was completed in fall 2012.

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Berlin STPG SGNL(40)

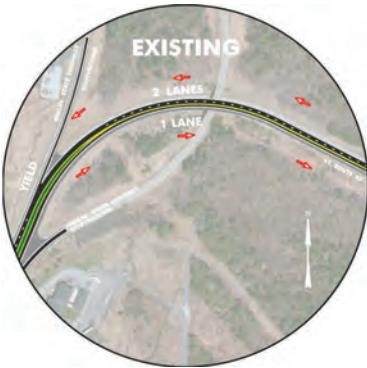
VT 62, Airport Rd., & Fisher Rd. Intersection



Looking westerly down VT 62 toward the VT 62/Fisher Rd/airport Rd intersection



Looking northerly down the Berlin State Highway.



Aerial view showing existing merge conditions of Berlin State Highway and VT 62.

Project History:

- This project is located in Berlin where the Berlin State Highway merges with VT 62.
- Over the last 5 years there have been a total of 13 crashes where Berlin State Highway and VT 62 come together. 4 of those 13 crashes resulted in injuries.

Design Solutions:

- Implement a temporary test condition, where VT 62 is reduced to a single lane, thus eliminating the yield condition for vehicles climbing the hill on Berlin State Highway.
- During the testing of this design, the lane reduction on VT 62 is established using 8 ½ foot tall delineation devices, line striping, and signs to channelize vehicles into the appropriate lane.
- During this test, VTrans is monitoring the safety and operation of the new merge condition, as well as evaluating any maintenance challenges that may arise.

Construction:

- If this test is successful, the condition will be permanent as part of a paving project in 2014. If it is not deemed appropriate, then the condition will be returned to its original state and further solutions investigated.
- Project Cost: Approximately \$25,000.



Aerial view showing the test merge condition of Berlin State Highway and VT 62.

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Hyde Park HES 030-2(23) VT 15 & VT 100 Roundabout Project



After Construction – looking westerly across the new roundabout.



After Construction-looking down the Rt 15 easterly approach



After Construction-looking easterly down Rt 15 from the middle of the roundabout

Project History:

- This project is located at the intersection of VT 15, VT 100, & Church St. in the town of Hyde Park.
- Intersection was listed in the top 50 statewide candidate safety improvement locations in the 2001 Highway Safety Improvement Program.
- In four years, this intersection saw 23 crashes, 26% of which resulted in injury.
- The major safety concerns observed included difficulty for motorists entering VT 15 from VT 100 and Church St. due to congestion, short gaps, and judging approach speeds.

Design Solution:

- Eliminate the existing stop controlled four-way intersection, and flashing beacon, and install a roundabout.

Construction:

- Construction commenced on this project in the spring of 2011. The roundabout was constructed and became fully operational in the fall of 2011. With the exception of some work on the truck apron, all construction activities were completed in the spring of 2012
- Project Cost: Approximately \$1,900,000

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Milton STP 5800(2) US 7 & Lake Road Intersection Project



Before construction: looking north across US 7, up Lake Rd.



After 2011 winter shutdown-looking north, across US 7, up Lake Rd.



After project completion in 2012- looking north up US 7.

Project History:

- This project is located at the intersection of US 7 and Lake Road, in the town of Milton.
- This intersection improvement was warranted because of safety concerns, as well as traffic congestion due to left hand turning traffic from US 7 onto Lake Road.
- In five years, this intersection experienced 22 crashes
- The major safety concerns observed included difficulty for motorists entering US 2 from Lake Road due to the skewed intersection alignment, and rear-end or broadside collisions for stopped or turning traffic onto Lake Road, from US 7.

Design Solutions:

- Improve the alignment of Lake Road with US 7, such that it's closer to a 90 degree intersection angle, install a left turn lane for vehicles turning left off of US 7 onto Lake Road, and improve the drainage around the intersection to reduce ice build-up on the roadway.

Construction:

- Construction commenced on this project in the spring of 2011. The intersection was reconstructed and became fully operational in the fall of 2011, with all construction activities completed in the spring of 2012.
- Project Cost: Approximately \$1,600,000.

Highway Safety and Design Annual Report

TRAFFIC OPERATIONS PROJECTS

Improving our roadway delineation by restriping our roadways is one of the best low cost initiatives for reducing crashes that we have. The following projects, where the placement of pavement markings was contracted out, allow our state maintenance forces to gain additional coverage to ensure that more miles of pavement markings are refreshed on an annual basis.

- Approximately 116 miles of sign upgrades were constructed in 2012, including:
- Two Corridor sign projects were constructed in 2012: 33 miles on US 5 from Springfield to Hartford, and 31 miles on VT 9 from Woodford to Marlboro.
- One regional sign project was constructed in the Northeast Kingdom, consisting of 17 miles on VT 114, VT 141, VT 147, and VT 253.
- Several paving projects also included project-wide sign upgrades for a total of approximately 35 miles, including 10 miles of Class 1 town highways in Barton and Newport.

Pavement Marking Projects:

- IM MARK (112) Interstate Marking: Annual painting of worn pavement markings.
- NH MARK(206) National highway System Marking: Annual painting of worn pavement markings. This year's project included 270 miles of markings on US 2, US 4, US 7, VT 9, VT 78, VT 103, VT 279 and VT 289.

Centerline Rumble Stripes:

Centerline Rumble Stripes (CLRS) were installed with three paving projects to decrease head-on and run-off-road crashes: 20 miles on US 7 Bennington-Manchester, 22 miles on US 2 St Johnsbury - Guildhall, and a short segment on VT 104 in Cambridge.

Vermont now has a total of 80 miles of CLRS. Crash trends on those highways where CLRS have been installed indicate an approximate 18% reduction in total crashes and a 36% reduction in injury related crashes.



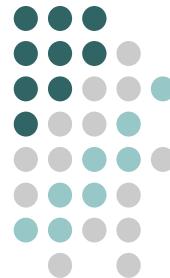
Example project showing newly installed pavement markings.

Sign Projects:

These sign projects are part of our asset management program to replace signs on a 15 year cycle, and put us on track to meeting the new federal sign retro-reflectivity requirements statewide by the compliance target of January 2015. Sign upgrades are also an important part of improving safety on Vermont highways, by providing enhanced warning and delineation of curves; improved intersection warning; more legible guide signs including upsized street name signs; and upgraded sign sheeting for better visibility.

Asset Management Highlights

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State-wide Guardrail Inventory (SGI)

The Statewide Guardrail Inventory (SGI) is an effort undertaken to locate, inventory, assess, and identify critical sections of guardrail for repair prioritization and replacement. The intent of the SGI is to provide a framework for the continued monitoring of all state owned sections (runs) using a variety of descriptive characteristics (e.g., geographic location, condition assessment, type, treatment, etc.).

Last year, approximately (1,500) segments of guardrail were captured within the Asset Management Unit's (AMU) Geographic Information System (GIS) from As-Built Plan drawings housed within the Digital Plan Room. These data were then added to the 2011 field season's (1,000) miles of record holdings and are slated for assessment (e.g., quality assurance and accuracy) in 2013.

Great strides also are continuing to be made towards the integration of these data into the Managing Assets for Transportation System (MATS) in use by our Operations Division to track work order history and maintenance operations upon those assets. In addition, the AMU's existing manual data extraction and acquisition methods are currently being refined to expedite and support the capture, storage, and the development of a leading-edge database environment.

Undoubtedly, these efforts will set the stage for the capture and association of repair, replacement, maintenance, and/or rehabilitation work activities to specific sections of guardrail (among our other assets) in efforts to validate, maintain, and preserve our standing/evolving inventories.

State-wide Small Culvert Inventory (SSCI)

Similar to the (SGI), the Statewide Small Culvert Inventory (SSCI) stores data (e.g., geographic location, structure type & condition, hydraulic treatments, etc.), specific to state-owned small drainage culverts (less than (72) inches in diameter).

In addition, these data not only promote the development of local site condition & characterization but support a process by which

prioritization and planning for repair, replacement and/or general maintenance activities can occur.

As with any asset data inventory within the AMU, the SSCI was designed with the intention to: 1) promote the effective management of our existing assets agency-wide, and, 2) enable access to those assets to a wide-array of agency users—for a variety of purposes. Therefore, validation of this inventory is critical and conducted through yearly field re-inspections with personnel using Global Positioning Systems (GPS). In addition, inspections also provide the setting for the update of specific maintenance work activities that exist within the current business process.

In 2012, the (SSCI) effort focused on the acquisition of small culverts along VT 100. A “pilot-program” was initiated to introduce the integration of maintenance districts into the field data collection process. Both District 5 and the AMU worked collaboratively to develop a data capture solution (which included the MS4) for the entire district. This program was successful and undoubtedly, will serve as a model for future field data collection endeavors.

In all, 2012's field data collection effort encompassed (400) miles of state highway and captured (21,000) culverts and (11,000) drop-inlets. Upon completion, these data were then imported into the Agency's Managing Assets for Transportation Systems (MATS) work-order management software package, and have paved the way for a whole host of capabilities to be further developed and explored to assist maintenance personnel in the visualization and update of those data as well as provide a platform for the enhancements to planning/reporting initiatives at multiple levels.

State-wide Road Data Inventory

Similar in-roads are being made for the development of a Roadway Data Inventory. Like Guardrail, Roadway data also is housed in many areas, sections, and forms. An ongoing goal for the AMU is to continue to capture these data from the array of existing sources for placement into the GIS and

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database realm. In 2012, approximately (4,900) roadway geometry features were captured from As-Built Plan drawings and stored.

This endeavor does not only provide the Agency with an extensive capability to swiftly access approximately (89) miles of roadway data attributes (e.g., lane width, shoulder information, turning lane, median, etc.) but, will promote a new development of cross-asset analyses using leading-edge analytical tools. In addition, these efforts will further development initiatives of the MATS integration and provide the framework for the future development of web-deployed, remote, as well as field-based applications for maintenance district personnel on a variety of platforms.

State-wide Sign Inventory

The AMU also is responsible for managing a traffic sign database inventory which consists of approximately (70,000) active records. Traffic signs are managed by VTrans and are found on interstate, US routes, Vermont routes, and state named routes. Data for signs are available from numerous sources. However, project plans, work orders, and knockdown forms are the primary supplier. These data are a critical component to assist the State in ensuring that new federal retro-reflectivity requirements can be met.

Other responsibilities include: the State-wide Sign Corridor Review, sign data flow reviews and collaborative efforts with the Tri-State Team. AMU is in the process of developing a Tri-State sign performance measure with Maine, New Hampshire and Vermont. The goal of this partnership is to develop standardized performance measures to facilitate communication with respective stakeholders as well as fortify development of the MATS initiative.

State-wide Lighting Inventory

This effort, also managed by the AMU, has acquired the locations of (1,016) lighting fixtures, and their associated descriptive characteristics state-wide. The goal of the Lighting Inventory, as with all other

inventories managed by the AMU, is to not only determine the geographic location of the asset for repair, replacement, and maintenance activity, but to explore where energy efficiency can be optimized through bulb replacement.

State-wide Signal Inventory

VTrans also is responsible for tracking approximately (154) traffic signals. Both the VTrans Traffic Shop and Traffic Design group work collaboratively and share data on a regular basis. This past year brought much needed consolidation of signal data from numerous locations into our Digital Print Room (DPR). This endeavor established a means to facilitate data sharing agency-wide as has provided inventory photos, traffic diagrams, plans and signal timing diagrams to a wide-array of VTrans personnel to support project scoping, investigation, planning, and analyses.

It is expected that AMU's continued migration of agency assets into leading-edge and industry-standard logical data format and structures will strengthen rapid and timely access to those data for exploration by its users. It is an overarching goal of the AMU to continue to facilitate and streamline data collection methods, storage procedures, offer new analytical techniques, promote collaborative efforts and educational outreach, to provide further understanding and insight into the complexities of those assets to develop and refine approaches for their management.



HIGHWAY SAFETY AND DESIGN
ASSET MANAGEMENT UNIT

Small Culvert Inventory

Field Season
2012

Mileage Complete
2012 Phase 1
Previous Years
MS4

This map represents data that has been
collected up to 12/31/2012.